Technical Memorandum #1:

Bay Area Travel Study Incentives Test

Final Report

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Table of Contents

List of Tables

Chapter 1 - Introduction

Results of recent household travel surveys suggest that response rates have been declining and respondent resistance is increasing. Because the data collected through household travel surveys are important components of transportation planning, there has been an increasing interest in using monetary or other incentives to motivate respondent participation, thereby increasing response rates.

Incentives for recent travel surveys include state lottery tickets, cash, and gifts (pens, magnets). A direct comparison of monetary incentives was conducted as part of the first wave of the Puget Sound Transportation Panel (1). It was found that an incentive of $1 per household sent out with the diary materials yielded slightly better participation rates than $10 per household that returned completed diaries (64 percent vs. 60 percent). Both monetary incentives increased the participation rate over no incentive (49 percent). At this juncture, however, there is no clear consensus among practitioners as to whether, or when, incentives should be considered for travel behavior surveys.

Current literature suggests that "prepayment of an incentive had significant positive effects on response rates." It signals to the respondent that the research is "sufficiently important to justify a rather bold and unusual gesture." (2) Others suggest that by including an incentive in advance, "the research extends a token of trust to the survey participant and initiates a social exchange relationship which invokes an obligation for the participant to reciprocate in kind" (3). In a recent review of incentives used in household travel surveys, Tooley found that "cash or other non-monetary incentives, especially those offered with the survey packet, have a positive effect on rates of return." (4).

Any evaluation of incentives must recognize that they are only one element of a comprehensive survey design, and that proper steps should be taken to achieve appropriate response rates through careful sample management, experienced interviewers, and prenotification and follow-up calls. (2) In addition, comparison of response rates across travel studies should be done cautiously, as various methods of calculation are used.

Incentives Test

In order to determine the impact of a non-monetary incentive on response rates, the Federal Highway Administration funded an incentives test as part of the 1996 Bay Area Travel Study (BATS). BATS was a comprehensive two-day activity and travel study conducted in California's San Francisco/Oakland Bay Area. All residents of the nine Bay Area counties were eligible for inclusion in the study. Randomly selected respondents were recruited by telephone, mailed a packet of respondent materials, and asked to track 48 hours of activity and travel for all members of the household then report that data over the telephone to an experienced telephone interviewer.

The 1996 study was conducted in two phases: January through May, then September through December. Respondents were assigned a two-day pair to track their information, with the goal being to achieve an equal distribution of day of week. All data collection was performed using trained interviewers employed by NuStats International of Austin, Texas. The result of this study was the collection of demographic data from 5861 recruited households, with 3708 of these households also providing complete activity data.

For the incentives test, households were randomly assigned to a control or test group. The assignment was done after recruitment took place, so respondents who agreed to participate knew nothing of the incentive. In addition, during the retrieval of data, interviewers did not know who had received a calculator, ensuring that all respondents were treated equally.

To remove any irregularities associated with project start-up or close-down, the assignment of households to control or test groups did not cover all assignment days. In addition, households that were rescheduled to new assignment dates were not included in the test. Of the 5861 recruited households, 4494 were included in the test.

Respondents included in both the test and control groups received packets of respondent material. Each packet contained a cover letter, study brochure, sample diary, and personalized diaries for each household member. Each household in the test group, regardless of size, received one credit-card size solar calculator at a cost of $1.86 each. They also received a different cover letter from those in the control group, as the test group cover letter referenced the enclosed calculator. The objective of the test was to determine if the inclusion of this type of incentive would result in a statistically higher response rate in the retrieval staging of the survey.

Report Purpose

The purpose of this report is to determine if the inclusion of the incentive resulted in a statistically higher response rate in the retrieval staging of the survey. In addition, the result of including such incentive on types of households that typically have higher non-response was examined to determine if a reduction in sample bias might also be achieved.

Response Rate Terminology

The basis of this report is the calculation of completion rates overall and for specific subgroups of the population. It is important to note that the term "response rates" means different things to different people, and is rarely calculated in the same manner. Generally, the term is used to designate the ratio of the number of completed interviews to the number of eligible units in the sample. However, in a multi-stage survey, there are overall response rates as well as completion rates for each stage of the process.

In a typical household survey, three response rates are reported: overall response rate, recruitment rate, completion rate, and overall response rate. The recruitment rate is calculated by dividing the number of households recruited by those eligible for recruitment. The completion rate is the division of the number of households providing complete travel data by the number recruited. An overall response rate is determined by multiplying the recruitment rate with the completion rate. An increase in the recruitment or completion rate will result in an increased overall response rate, cetaris parabis.

For this report, the completion rate is the focus of study. Specifically under investigation is the percent of recruited households that complete the study versus those recruited households that do not.

Chapter 2 - Results of Incentive Test

As discussed above, one objective of the incentives test was to determine if the inclusion of this type of incentive would result in a statistically higher response rate, based on an increase in the completion rate. The completion rate for this analysis was calculated by dividing the number of households that completed the study by the total number recruited. This calculation follows guidelines established by the Council of American Survey Research Organizations.

Interviewers made up to ten attempts (in some cases more) to retrieve travel and activity data from the recruited households. Each call attempt was recorded on the sample sheet and entered into a database. This call outcome or "disposition" is used for calculating response rates. Retrieval dispositions fall into one of three categories: completed, not completed, or invalid recruits.

A small number of recruited households were excluded from the calculations because they were "invalid" recruits. These households were either:

- improperly recruited (head of household never agreed to participate and knew nothing of the study),
- interviewer error (recording the wrong telephone number in the system, or
- using the phone line for computer or fax rather than voice communications and attempts varied by time of day and day of week all resulted in non-voice contact.

These households, which accounted for about three percent of the sample, were removed from the denominator.

Calculation of Completion Rate

As shown in Table 1, an equal division of the sample between the test ("Calculator") and control ("No Calculator") groups was achieved. In addition, the number of invalid recruits was 3 percent of the overall sample.

Table 1
Call Outcomes by Incentive Test Group

Call Outcome	Calculator	No Calculator	Total
Eligible	**2198**	**2144**	**4342**
Mail-In	57	45	102
Refusals	408	463	871
Partial Complete	98	110	208
Complete	1491	1359	2850
Unable to Contact HH	144	167	311
Invalid Recruits	**76**	**76**	**152**
Total	**2274**	**2220**	**4494**

Base: All households recruited and included in incentives test.

As discussed above, the completion rate is calculated as follows:

$$\text{Completion Rate} = \frac{\text{Completes}}{\text{Total - Invalid Recruits}}$$

By applying this calculation to the call outcomes displayed in Table 1, the following rates were achieved:

Total: 2850/(4494-152) = 65.5%

Calculator (Test) Group: 1491/(2274-76) = 67.8%

No Calculator (Control) Group: 1359/(2220-76) = 63.4%

The direct result of the incentives test was a 4 percent increase in the response rate. A chi-square test was run to determine if the inclusion of calculators had a statistical impact on completion rates. The result of this test does suggest that there is a dependent relationship between the provision of a calculator and the completion of the retrieval stage of the survey.

Population Sub-Group Analysis

The next phase of the analysis was to determine if the completion rate differences came from the inclusion of an incentive or the demographic/geographic factors describing the household. This was accomplished through a review of the distribution of key demographic variables for households recruited versus those completed. The variables considered included household size, number of workers in the household, dwelling type, number of household vehicles, household income, and ethnicity. For each of these same variables, the completion rate by subgroup is also presented.

As shown in Table 2, two-thirds of all households that completed the survey were smaller households (1-2 persons). Mid-size households (3-4 persons) accounted for one-fourth, while only about 6 percent of the sample represented larger households (5+ persons). This distribution held for households recruited and completed, regardless of test group.

Table 2
Household Size

Household Size	Recruited		Completed	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1356)
1	28.5%	28.0%	34.8%	34.6%
2	32.2%	33.5%	33.7%	33.7%
3	16.7%	15.9%	15.1%	14.4%
4	13.7%	14.5%	10.5%	12.0%
5	6.0%	5.1%	4.4%	3.4%
6	1.5%	2.3%	0.7%	1.3%
7+	1.4%	0.8%	0.7%	0.7%

Base: All households included in incentives test.

The data in Table 3 show completion rates by household size. The inclusion of a calculator resulted in significantly higher rates for smaller households, while medium and larger households remained unaffected.

Table 3
Completion Rates by Household Size

Household Size	Calculator	No Calculator	Chi Square	Independent?
1 - 2 persons	76.1%	69.8%	11.36477	No
3 - 4 persons	57.4%	56.2%	0.33715	Yes
5 or more persons	46.4%	41.4%	1.25242	Yes
Total	67.8%	63.4%		

Independence determined at the 0.5 level of significance.

The distribution of workers in within the households is shown in Table 4. Roughly 16 percent of the households had no workers, being mainly composed of retirees and students. Corresponding with household size, almost three-fourth of all households had 1 or 2 workers, while very few (less than 3 percent) had more than 3 members that were employed.

Table 4
Household Workers

# Workers in Household	Recruited		Completed	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1356)
0	15.5%	15.9%	16.6%	16.6%
1	39.6%	38.5%	42.1%	41.7%
2	36.2%	37.4%	35.0%	35.8%
3	6.4%	5.0%	4.4%	3.5%
4	1.7%	2.3%	1.2%	1.6%
5+	0.6%	0.9%	0.7%	0.7%

Base: All households included in incentives test.

Completion rates by household worker contingent are shown in Table 5. Of interest here is that households with 2 workers were the only subgroup affected by the inclusion of an incentive.

Table 5
Completion Rate by Household Workers

# Workers in Household	Calculator	No Calculator	Chi Square	Independent?
0	74.0%	67.6%	3.20319	Yes
1	70.8%	67.1%	2.41869	Yes
2	60.5%	55.2%	4.12281	No
3+	67.1%	64.1%	0.28095	Yes
Total	68.8%	64.3%		

Independence determined at the 0.5 level of significance.

Traditionally, apartment and mobile home dwellers have been underrepresented in household travel surveys. This is largely due to the use of a telephone-based sample rather than one based on physical household address. As shown in Table 6, the Bay Area Travel Study data comes mainly from households dwelling in traditional single family homes.

Table 6
Household Dwelling Type

Dwelling Type	Recruited		Complete	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1356)
Single family, detached	62.1%	62.8%	61.8%	64.5%
Duplex	5.1%	5.0%	4.8%	5.2%
Apartment	21.3%	20.7%	22.0%	20.1%
Condo/Townhouse	8.6%	9.2%	8.7%	8.6%
Mobile Home/Trailer	1.5%	0.8%	1.2%	0.5%
Hotel/Motel	0.1%	0.0%	0.1%	0.1%
Group Quarters	0.2%	0.3%	0.3%	0.1%
Other	0.5%	0.4%	0.4%	0.6%
Don't Know/Refused	0.7%	0.7%	0.6%	0.3%

Base: All households included in incentives test.

As shown in Table 7, the inclusion of an incentive has a positive effect on completion rates by households dwelling in apartments, condos, and mobile homes.

Table 7
Completion Rates by Household Dwelling Type

Dwelling Type	Calculator	No Calculator	Chi Square	Independent?
Single Family	67.3%	64.1%	1.83779	Yes
Duplex	64.9%	65.4%	0.00499	Yes
Apartment	71.0%	63.4%	6.86970	No
Condo/Townhouse	68.1%	60.9%	3.40793	Yes
Mobile Home / Trailer	54.5%	43.8%	1.14245	Yes

**Remaining subgroups too small for inclusion in analysis
Independence determined at the 0.5 level of significance.

About two-thirds of the households included in the incentives test owned 1 or 2 vehicles, as shown in Table 8. A very small percentage of households had either no vehicles or more than 3 vehicles.

Table 8
Household Vehicles

# Vehicles in Household	Recruited		Completed	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1356)
0	6.4%	6.7%	5.2%	6.4%
1	32.3%	31.2%	36.2%	34.9%
2	39.9%	38.9%	39.8%	38.0%
3	14.7%	15.6%	13.7%	14.7%
4+	6.6%	7.5%	5.1%	6.0%

Base: All households included in incentives test.

Households with more vehicles tend to have higher trip rates, provided the vehicles are in working condition. With this group, the goal would be to increase response rates for households with a larger number of vehicles. However, the inclusion of an incentive did not significantly impact that group. Rather, households with 1 or 2 vehicles were affected.

Table 9
Completion Rate by Household Vehicles

# Vehicles in Household	Calculator	No Calculator	Chi Square	Independent?
0	56.6%	60.4%	0.95339	Yes
1	76.1%	71.3%	4.63620	No
2	67.1%	61.5%	6.04767	No
3	63.6%	60.1%	0.75561	Yes
4+	52.0%	50.0%	0.07374	Yes
Total	67.8%	64.3%		

Independence determined at .05 level of significance.

Household income is one of the most difficult data elements to collect in a household travel survey. Respondents tend to be reluctant to disclose this information, and interviewers reluctant to probe. As a result, at least three attempts were made to collect this data during the Bay Area Travel Study. As a result of these efforts, income non-response ranged from 11 percent to just over 15 percent for the households included in the incentives test.

Table 10
Household Income

Household Income	Recruited		Completed	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1359)
< $5k	0.9%	0.8%	1.0%	0.7%
$5k to <$10k	2.1%	2.1%	2.2%	2.7%
$10k to < $15k	3.6%	3.4%	3.8%	3.9%
$15k to < $20k	3.2%	3.8%	2.8%	3.9%
$20k to < $25k	5.5%	4.7%	5.8%	6.9%
$25k to < $30k	4.7%	4.1%	5.0%	4.2%
$30k to < $35k	4.7%	5.4%	4.7%	5.2%
$35k to < $40k	6.9%	6.3%	7.5%	5.6%
$40k to < $45k	7.4%	6.8%	7.2%	6.9%
$45k to < $50k	6.2%	5.7%	6.1%	5.8%
$50k to < $60k	8.6%	8.4%	8.5%	8.9%
$60k to < $75k	9.1%	9.8%	9.4%	10.3%
$75k to < $100k	10.2%	11.3%	10.8%	12.6%
$100k to < $125k	5.3%	5.0%	5.4%	5.5%
$125k more	6.0%	5.8%	6.3%	5.5%
Don’t know	2.2%	1.9%	1.4%	1.4%
Refused	13.5%	14.9%	12.2%	11.8%

Base: All households included in incentives test.

Due to small subgroup sample sizes, household income ranges were combined prior to calculating completion rates. The inclusion of an incentive did not significantly impact the completion rates for low income (earning less than $20,000) households, which were underrepresented in this study. The incentive had the most significant effect on households in the $20,000 to less than $40,000 range.

Table 11
Completion Rates by Household Income

Household Income	Calculator	No Calculator	Chi Square	Independent?
<$5k to < $20k	69.4%	72.3%	0.59528	Yes
$20k to < $40k	72.4%	62.5%	10.41742	No
$40k to < $60k	66.3%	66.8%	0.08928	Yes
$60k to $125k or more	69.5%	66.5%	1.19804	Yes
Don't know/Refused	59.4%	50.1%	5.63792	No
Total	67.8%	63.4%		

Independence determined at the 0.05 level of significance.

In the Bay Area Travel Study, ethnic origin was asked for each household member. A proxy household-level variable was created based on the ethnicity of the household contact or spokesperson. (This was the person that committed the household to participating in the study.) As shown in Table 12, the respondents were primarily white, non-Hispanic. The majority of respondents in the "Other" category were of more than one ethnicity.

Table 12
Household Ethnicity

Ethnicity	Recruited		Completed	
	Calculator (n=2274)	No Calculator (n=2220)	Calculator (n=1491)	No Calculator (n=1359)
Hispanic	10.4%	11.1%	8.5%	9.6%
White, non-Hispanic	66.6%	65.8%	71.9%	72.9%
Black, non-Hispanic	8.5%	8.0%	7.0%	5.5%
Asian / Pacific Islander	9.0%	9.2%	7.9%	7.4%
Other	3.1%	3.6%	2.8%	2.4%
Don't know/refused	2.4%	2.3%	1.9%	2.3%

Base: All households included in incentives test.

The inclusion of an incentive significantly impacted the completion rates of non-Hispanic African Americans.

Table 13
Completion Rates by Household Ethnicity

Household Ethnicity	Calculator	No Calculator	Chi Square	Independent?
Hispanic	58.2%	56.5%	0.02777	Yes
White, non-Hispanic	72.5%	69.1%	3.43056	Yes
Black, non-Hispanic	57.5%	45.4%	5.39521	No
Asian/Pacific Islander	60.2%	51.8%	2.51100	Yes
Other	58.6%	44.4%	1.01190	Yes
Don't know/refused	53.8%	62.7%	4.74386	No
Total	67.8%	64.3%		

Independence determined at 0.05 level of significance.

Chapter 3 - Conclusions and Recommendations

The purpose of this report was to determine if the inclusion of a non-monetary incentive had an impact on overall response rate or the response rates of specific population sub-groups that tend to be underrepresented in household travel studies. The results contained herein suggest that the inclusion of a credit-card sized solar calculator did significantly improve overall response rates by 4 percent (from 63 percent to 67 percent).

The impact of incentive use on completion rates for population subgroups was also reviewed. The data suggest that a non-monetary incentive would be useful for increasing the response rates of:

- small households (1-2 persons),
- households with 2 workers ,
- apartment dwellers,
- households with 1 or 2 vehicles,
- households earning between $20,000 and $40,000 per year, or
- non-Hispanic African American households.

In considering the use of an incentive as part of a comprehensive approach to a household travel study, the trade-off between budget implications and improved response rates should be weighed carefully. If the area to be studied has a high rate of apartment dwellers or persons of African American descent, (or any of the other subgroups listed above), the results of this study suggest that a non-monetary incentive would statistically improve the completion rates for these subgroups of the study area population.

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